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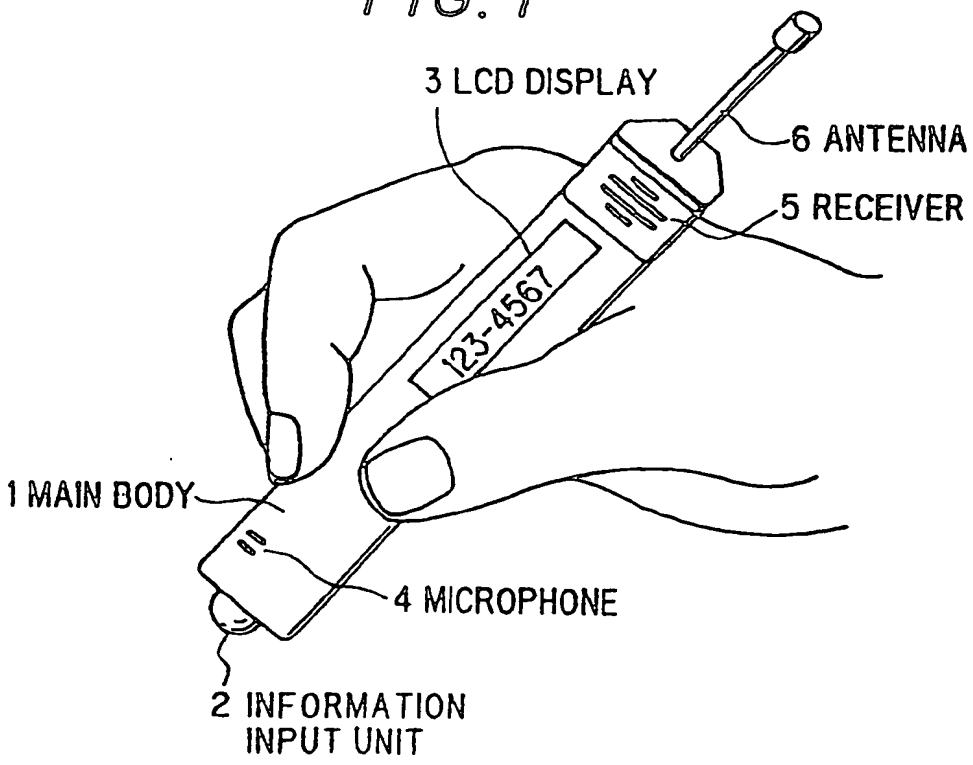
## (54) Portable radio telephone set.

(57) A portable radio telephone set comprises a telephone number generating apparatus and a telephone number transmitting apparatus which are preferably contained in a pencil shaped body (1). The telephone number generating means generates a telephone number signal, for instance, by sensing the motion of a ball (11) provided on a lower end of the body. The ball is moved to draw a telephone number on a surface of an article. The telephone number signal is modulated in the telephone number transmitting apparatus to be transmitted to air by an antenna (6) which is provided on an upper end of the body.

FIG. 1




EP 0 439 340 A2

# PORTABLE RADIO TELEPHONE SET

## FIELD OF THE INVENTION

This invention relates to a portable radio telephone set,and more particularly to, an improvement of a dial unit in a portable radio telephone set.

## BACKGROUND OF THE INVENTION

In general, a portable radio telephone set comprises a dial operation unit having a plurality of push buttons for generating a calling signal and a telephone number signal of a called party. In this portable radio telephone set, a calling party presses the selected push buttons in turn to generate a telephone number signal which is supplied to a control unit of the telephone set, so that the telephone set of the calling party is connected through a communication channel to a telephone set of the called party.

Otherwise, a portable radio telephone set having a voice recognition apparatus has been proposed. In this portable radio telephone set, a calling party voices a telephone number of a called party by facing the telephone set, so that the voice recognition apparatus recognizes the voice of the calling party to generate a telephone number signal of a called party. Consequently, the telephone set of the calling party is connected through a communication channel to a telephone set of a called party.

However, the former portable radio telephone set has a disadvantage in that a limitation occurs in making the size of the telephone set small, because the plural push buttons must be provided on a main body of the telephone set to generate a telephone number signal.

In addition, the latter portable radio telephone set has a disadvantage in that it is difficult to dial a telephone number of the called party in a confidential manner, because the telephone number is voiced at a predetermined voice level by the calling party.

## SUMMARY OF THE INVENTION

Accordingly, it is an object of the invention to provide a portable radio telephone set having less limitation in making the size of the telephone set small.

It is a further object of the invention to provide a portable radio telephone set, in which a telephone number of a called party is dialed in a confidential manner.

According to this invention, a portable radio telephone set, comprises :

means for generating pattern signals of letters indicative of a telephone number ;

a memory for storing patterns of letters ;

means for comparing the pattern signal and the stored pattern to generate a coincidence signal therebetween ; and

means for transmitting a telephone number signal to a station of a called party, the telephone number signal being provided by the coincidence signals.

## BRIEF DESCRIPTION OF THE DRAWINGS

This invention will be explained in more detail in conjunction with the appended drawings, wherein :

Fig. 1 is a perspective view showing a portable radio telephone set in a preferred embodiment according to the invention ;

Fig. 2 is an enlarged perspective view showing an information input unit in the portable radio telephone set in the preferred embodiment ;

Fig. 3 is a block diagram showing the portable radio telephone set in the preferred embodiment;

Figs. 4A and 4B are explanatory diagrams showing output signals of encoders in the portable radio telephone set in the preferred embodiment, and a pattern defined by the output signals, respectively ; and

Figs. 5A to 5C are a flow chart explaining operation of the portable radio telephone set in the preferred embodiment.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 1 shows a portable radio telephone set in a preferred embodiment according to the invention. The portable radio telephone set comprises a main body 1 of a pencil shape which is provided at a first end with an information input unit 2 and at a second end with an antenna 6, an LCD display 3 at the approximately central portion of the main body 1, a microphone 4 in the vicinity of the first end, and a receiver 5 in the vicinity of the second end. This portable radio telephone set s held in operation by a hand of a calling party or a called party.

Fig. 2 shows the information input unit 2 which comprises a ball 11 rotating in an arbitrary direction, and X- and Y- direction rotary encoders 12 and 13 having X- and Y- axes intersecting orthogonal to each other at an origin 0. The encoders 12 and 13 comprise rollers 14 and 15 which are in contact to be rotated with the ball 11, gears 18 and 19 connected to the rollers 14 and 15 by rotary shafts 16 and 17, and photo-interruptors 24 and 25 for generating signals indicative of moving distances of the ball 11 in the X- and Y- directions by cooperation with the gears 18 and 19, respectively. The photo-interruptors 24 and 25 comprise LEDs 20 and 21 for emitting lights, and

phototransistors 22 and 23 for receiving the lights passing through portions having no teeth on the outer peripheries of the gears 18 and 19 to generate the moving distance signals, respectively.

Fig. 3 shows the portable radio telephone set in the preferred embodiment which comprises a CPU 31 including an arithmetic logic unit, a letter counter, a register set, etc. for receiving the ball moving distance signals generated in the rotary encoders 12 and 13 by cooperation with the ball 11, a pattern ROM 32 for storing patterns of numerical and alphabetical letters, a program ROM 33 for storing program, by which a telephone number signal and a station name signal of a called party are generated, a RAM 34 having a first region for storing data temporarily and a second region for storing data in non-volatile mode, an I/O port 35, a modulator/demodulator 36 for modulating the telephone number and station name signals of the called party and demodulating a signal received from another station, an amplifier 37 for amplifying the modulated signal and a signal supplied from the microphone 4, an amplifier 38 for amplifying the received signal supplied to the receiver 5, a transmitting and receiving apparatus 39 for transmitting the modulated signal to air by the antenna 6 and receiving a signal received by the antenna 6, and an LCD driver 40 for driving the LCD display 3 to display a telephone number and a station name of the called party, etc.

In operation, a calling party holds the portable radio telephone set by a hand, as shown in Fig. 1, and presses the ball 11 of the information input unit 2 on an appropriate plane such as a desk to draw numerical or alphabetical letters such as a telephone number or a station name of a called party. Then, the ball 11 is rotated to rotate the rollers 14 and 15, rotating speeds of which are proportional to ball moving distances of the X- and Y- directions. Consequently, the ball moving distance signals X and Y having pulse numbers proportional to the X- and Y- ball moving distances are generated for a predetermined time t in accordance with the light shielding effect by the teeth on the outer peripheries of the gears 18 and 19 in the rotary encoders 12 and 13, respectively, as shown in Fig. 4A, and are supplied to the CPU 31, in which the pulse numbers x and y are counted. The pulse number counting operation is sequentially continued for the successive predetermined time t. The counted values x, x' ..... and y, y' ..... are stored into the RAM 34 to provide a pattern of a letter, as shown in Fig. 4B. This pattern is compared with a pattern stored previously in the pattern ROM 32, so that the input pattern is determined to be a letter which is equal to a letter defined by the pattern of the pattern ROM 32, when the both pattern are coincided. This determined letter is displayed on the display 3 by the LCD driver 40. In Fig. 1, the displayed telephone number is "123-4567".

This operation will be explained in more detail in conjunction with Figs. 5A to 5C.

The ball moving distance signals X and Y are supplied from the X- and Y- encoders 12 and 13 to the CPU 31 (step $S_1$), and the pulse numbers x, x' ..... and y, y' ..... of the ball moving distance signals X and Y are counted (step $S_2$). When the ball moving distance signals X and Y are ceased to be supplied to the CPU 31 (step $S_3$), a pattern defined by the counted pulse numbers x, x' ..... and y, y' ..... of the ball moving distance signals X and Y is compared with a pattern of the pattern ROM 32 (step $S_4$). When the matching of the both patterns is detected in this comparison (step $S_5$), a content of the letter counter is checked (step $S_7$). On the other hand, when the both patterns are not coincided, an error is displayed on the display 3 (step $S_8$). When the letter counter is zero, an input letter is checked as to whether it is numerical or alphabetical (step 8). The first input letter "1" is an alphabetical letter, so that a dial input mode is set and the input letter is displayed on the LCD display 3 (step $S_{12}$). As a result, the content of the letter counter is increased by one (step $S_{13}$). Thus, the input of the telephone number "123-4567" is carried out. In this dial input mode, the registration mode is not set (step $S_{14}$ following step $S_7$), because the telephone number "123-4567" is not completely supplied to the CPU 31. The second to final (seventh) letter "2" to "7" are numerical (step $S_{15}$), so that these letters are in turn displayed on the LCD display 3 (step $S_{12}$), and the letter counter is increased one by one (step $S_{13}$) to finally count "7". When the telephone number "123-4567" is completely dialed by manipulating the main body 1 having the information input unit 2, the letter "M" is then drawn to be supplied to the CPU 31. As a result, the telephone number "123-4567" is transferred to be stored into the first region of the RAM 34 (step $S_{16}$), so that the registration mode is set (step $S_{17}$).

Next, letter patterns of the station name "NIPPON DENKI" of the called party which is defined "α-TAG" in the flow chart as shown in Fig. 5 are supplied to the CPU 31. The input letters are alphabetical (step $S_{32}$ following step $S_{14}$), so that the input letters are in turn displayed on the LCD display 3 (step $S_{36}$), and the letter counter is increased one by one to finally count "18" ("7" + "11") (step $S_{37}$). When the input of the station name is completed, the letter "M" is then drawn to be supplied to the CPU 31, so that the station name is transferred to be stored into the first region of the RAM 34 (step $S_{33}$) together with the telephone number. When the station name is stored in the first region of the RAM 34 following the store of the telephone number, these contents are cleared in the first region of the RAM 34 to be transferred into the second region of the RAM 34 (step $S_{34}$). Thus, the telephone number "123-4567" of the called party and the station name "NIPPON DENKI" corresponding thereto are stored into the second region of the RAM 34. At the same time, the letter counter is cleared (step $S_{35}$).

In this state, when the called party's station name

"NIPPON DENKI", and then the letter "S" are drawn to be supplied to the CPU 31 by use of the information input unit 2, the station name is stored in the first region of the RAM 34 (step $S_{10}$), the letter counter is increased one by one to finally count "11 " (step $S_{11}$), and the second region of the RAM 34 is accessed for the index of "NIPPON DENKI" and for the check of data coincidence (step $S_{19}$ and $S_{20}$ following step $S_{18}$), so that the telephone number "123-4567" is read from the second region from the RAM 34 to be modulated in the modulator/demodulator 36 and amplified in the amplifier 37. Then, the amplified telephone number is transmitted from the transmitting and receiving apparatus 39 through the antenna 6 to air (step $S_{21}$). Then, the called party's station name stored in the first region of the RAM 34 is cleared (step $S_{22}$), and the content "11" of the letter counter which is increased by the input of "NIPPON DENKI" (step $S_{30}$ and $S_{31}$) is cleared (step $S_{23}$). On the other hand, when the data coincidence is not detected (step $S_{20}$), "error" is displayed on the LCD display 3 (step $S_{24}$), and the telephone number calling operation is then abandoned (step S25).

Here, it is assumed that the telephone number "123-4567" and the station name corresponding thereto are not in advance stored in the second region of the RAM 34. In such a case, the telephone number "123-4567" and then the letter "S" are drawn on the desk to be supplied to the CPU 31 by use of the information input unit 2, so that the telephone number signal which is modulated in the modulator/demodulator 36 is transmitted from the transmitting and receiving apparatus 39 through the antenna 6 to air (step $S_{28}$ following step $S_{18}$). Then, the telephone number stored in the first region of the RAM 34 is cleared (step $S_{27}$), and the content "7" of the letter counter is cleared (step $S_{28}$).

Otherwise, when the letter "C" is supplied to the CPU 31 during the process, in which a part or whole of the telephone number or the station name corresponding thereto is supplied to the CPU 31, the process is abandoned (step $S_{29}$). On the other hand, when the letter "C" is supplied to the CPU 31 in accordance with the termination of communication (telephone conversation), the connection is turned off between the calling and called parties (step $S_9$). That is, as a result of the letter input "C", all states are reset to provide an initial state.

In this operation, instructions such as the completion of information input, the calling from a calling party to a called party, and the cancellation of input information are carried out by the letters "M", "S" and "C" symbols "@", "&", etc., greek letters "α", "β", "γ", etc,, so that the letters "M", "S" and "C" can be used for the station name of a called party.

In the preferred embodiment, although the information unit comprises the ball and the X- and Y-encoders, it may comprises a scanning apparatus composed of CCD devices for reading a telephone number or a station name of a called party written on a paper, a sheet, etc.

Although the invention has been described with respect to specific embodiment for complete and clear disclosure, the appended claims are not to be thus limited but are to be construed as embodying all modification and alternative constructions that may occur to one skilled in the art which fairly fall within the basic teaching herein set forth.

## Claims

1. A portable radio telephone set, comprising :
   means for generating pattern signals of letters indicative of a telephone number ;
   a memory for storing patterns of letters ;
   means for comparing said pattern signal and said stored pattern to generate a coincidence signal therebetween ; and
   means for transmitting a telephone number signal to a station of a called party, said telephone number signal being provided by said coincidence signals.

2. A portable radio telephone set, according to claim 1, wherein :
   said generating means, said memory, said comparing means, and said transmitting means are contained in a main body having a pencil shape, said main body being held by a hand of an operator ;
   said generating means includes a ball partly protruded out of a first end of said main body and rotating on a plane, means for detecting moving distances in first and second directions orthogonal to each other of said ball, and means for defining a pattern of a letter by said moving distances ; and
   said transmitting means is connected to an antenna provided on a second end of said main body.

3. A portable radio telephone set, according to claim 2, wherein :
   said detecting means includes first and second photo-interruptors each having a light-passing and shielding gear which is rotated in a corresponding one of said first and second directions by said ball, said gear being positioned between said light emitting and receiving devices.

4. A portable radio telephone set, comprising :
   a ball rotating to be moved on a surface of an article by manipulation of an operator ;
   first and second encoders for generating first and second signals of ball moving distances

in first and second directions orthogonal to each other ;

means for generating pattern signals of letters in accordance with said first and second signals ;

a first memory for storing patterns of letters ;

a second memory having a first region for storing said pattern signals temporarily and a second region for storing said pattern signals transferred from said first region in non-volatile mode;

means for comparing a pattern defined by said pattern signals with a pattern of said first memory to generate a coincidence signal ;

means for modulating a telephone number obtained from patterns determined by said coincidence signals ; and

means for transmitting said modulated telephone number to air by an antenna.

5. A portable radio telephone set, according to claim 4, wherein :

said second memory stores a telephone number of a called party and a station name corresponding to said telephone number in the form of said pattern signals.

6. A portable radio telephone set, according to claim 4, wherein :

said ball is partly protruded out of a first end of a pencil shaped main body ;

said first and second encoders, said generating means, said first memory, said second memory, said comparing means, said modulating means, and said transmitting means are contained in said pencil shaped main body ; and

said antenna is provided on a top of a second end of said pencil shaped main body.

7. A portable radio telephone set, comprising :

means for scanning letters defined on a sheet material to generate pattern signals of said letters ;

a first memory for storing patterns of letters ;

a second memory having a first region for storing said pattern signals temporarily and a second region for storing said pattern signals transferred from said first region in non-volatile mode;

means for comparing a pattern defined by said pattern signals with a pattern of said first memory to generate a coincidence signal ;

means for modulating a telephone number obtained from patterns determined by said coincidence signals ; and

means for transmitting said modulated telephone number to air by an antenna.

8. A portable radio telephone set, according to claim 7, wherein :

said second memory stores a telephone number of a called party and a station name corresponding to said telephone number in the form of said pattern signals.

9. A portable radio telephone set, according to claim 7, wherein :

said scanning means is provided at a first end of a pencil shaped main body ;

said first and second encoders, said generating means, said first memory, said second memory, said comparing means, said modulating means, and said transmitting means are contained in said pencil shaped main body ; and

said antenna is provided on a top of a second end of said pencil shaped main body.

10. A portable radio telephone set, according to claim 7, wherein :

said scanning means, includes :

a light source for emitting light to said sheet material ;

means for receiving light reflected from said sheet material ; and

means for generating said pattern signals by intensity of said received light.

FIG. 1

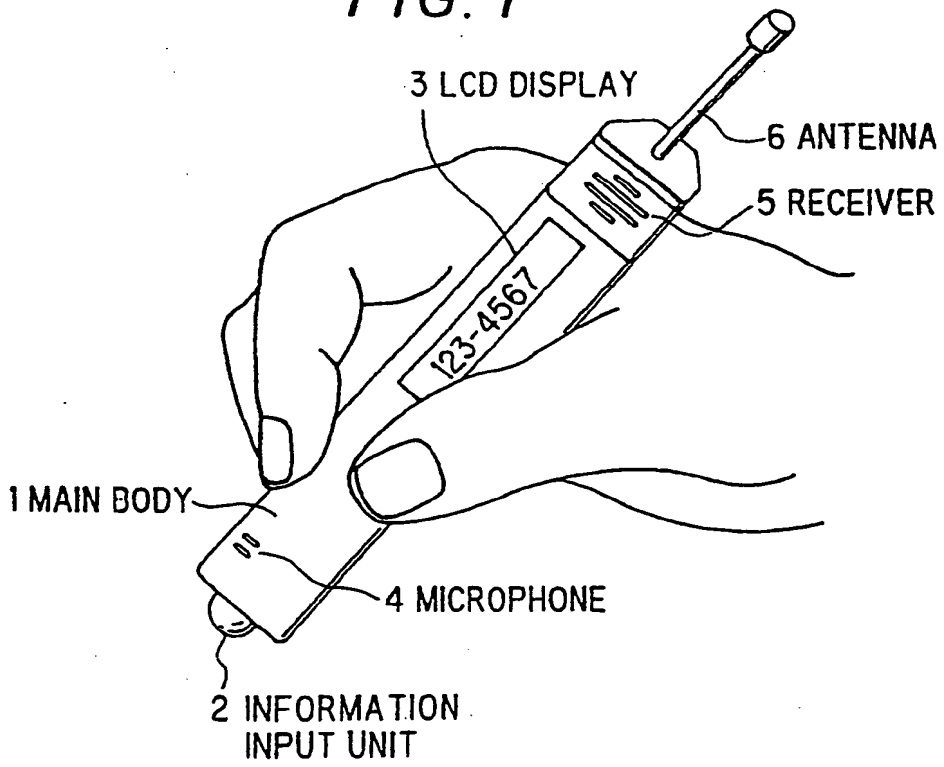

3 LCD DISPLAY
6 ANTENNA
5 RECEIVER
123-4567
1 MAIN BODY
4 MICROPHONE
2 INFORMATION INPUT UNIT

FIG. 2

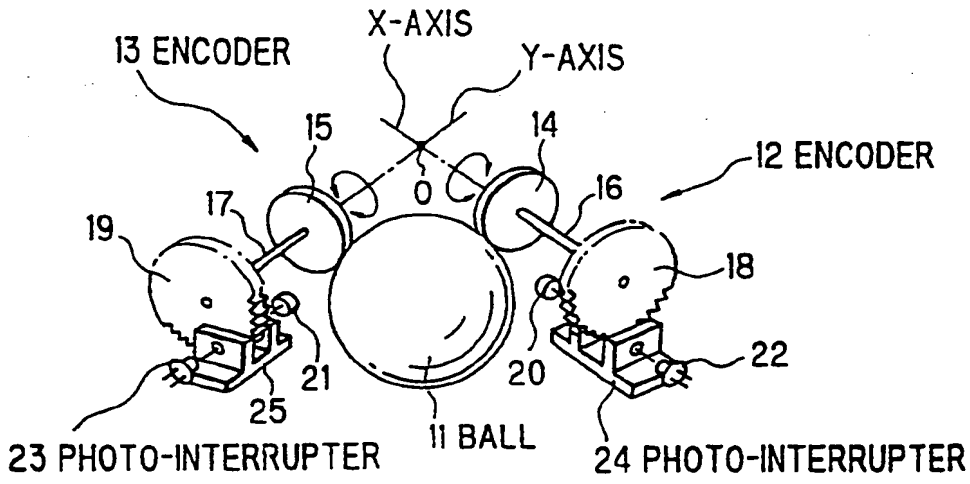

X-AXIS
13 ENCODER
Y-AXIS
15
14
12 ENCODER
0
16
17
19
18
21
20
22
25
23 PHOTO-INTERRUPTER
11 BALL
24 PHOTO-INTERRUPTER

FIG. 3

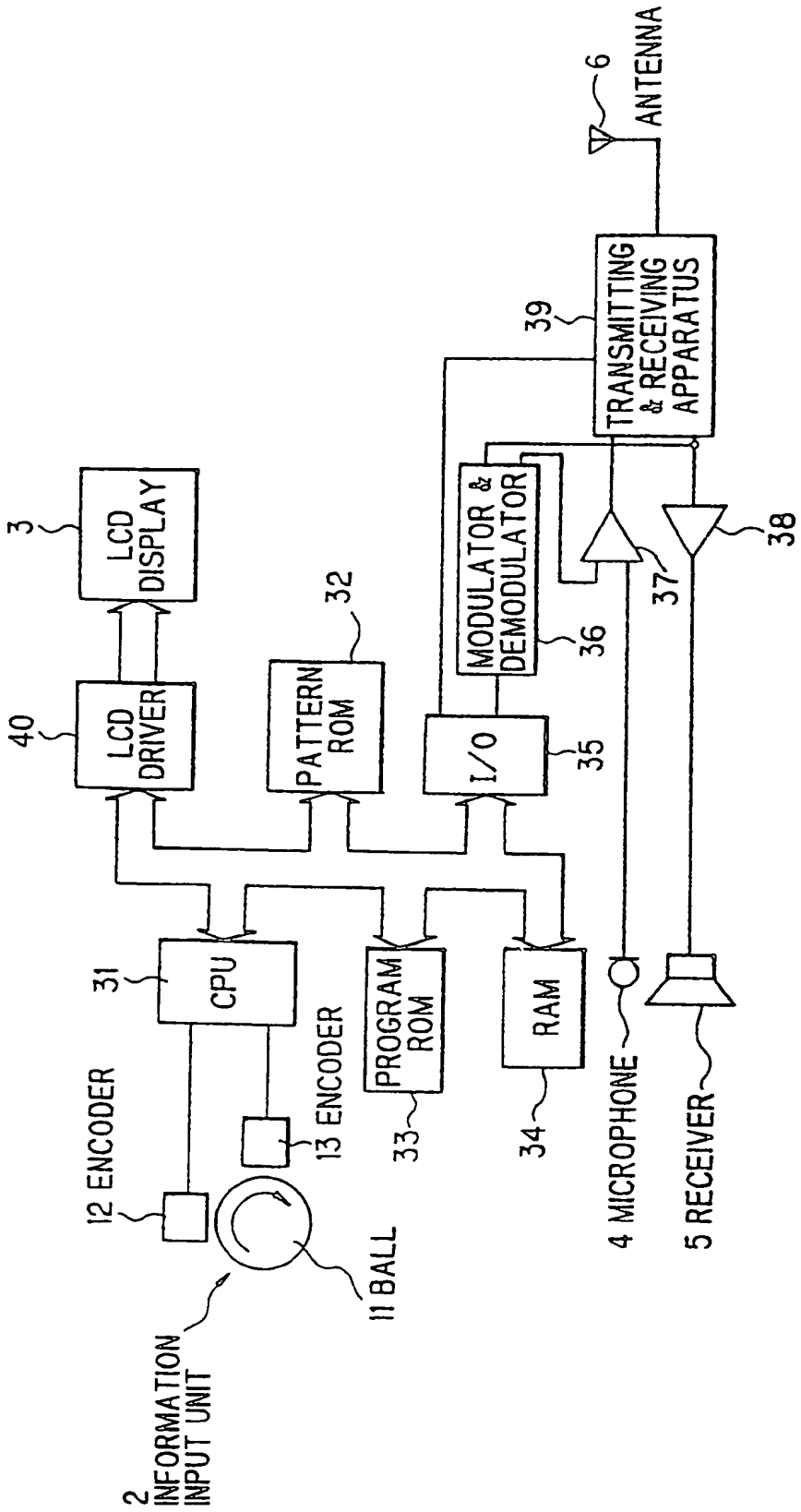

2
INFORMATION
INPUT UNIT
11 BALL
12 ENCODER
13 ENCODER
31
CPU
33
PROGRAM
ROM
34
RAM
4 MICROPHONE
5 RECEIVER
35
I/O
36
MODULATOR &
DEMODULATOR
37
38
39
TRANSMITTING
& RECEIVING
APPARATUS
6
ANTENNA
40
LCD
DRIVER
32
PATTERN
ROM
3
LCD
DISPLAY

FIG. 4A

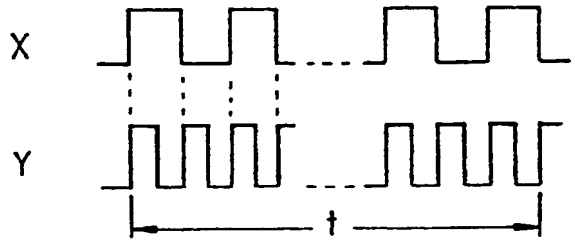



FIG. 4B

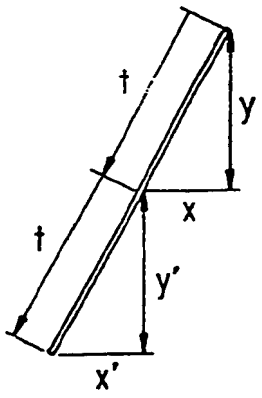


FIG. 5A

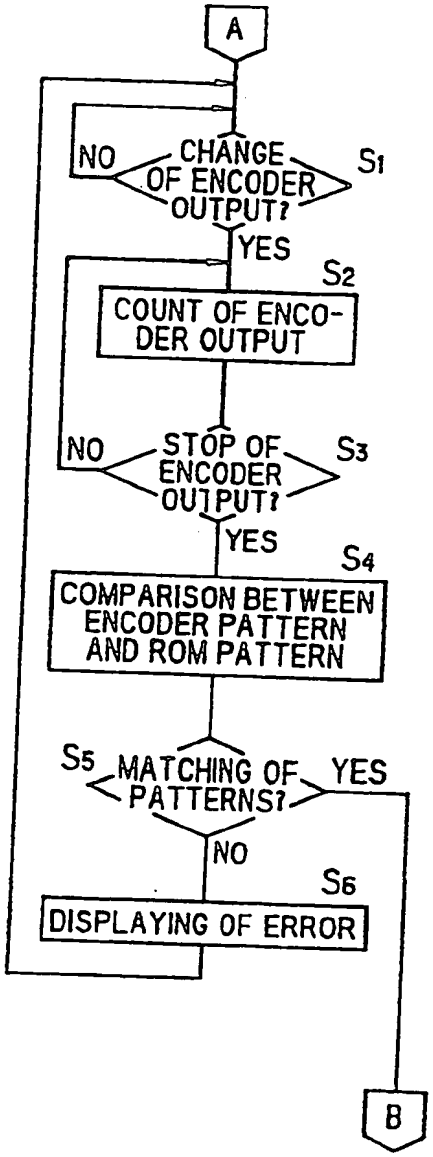

A
NO
CHANGE OF ENCODER OUTPUT?
S1
YES
S2
COUNT OF ENCODER OUTPUT
NO
STOP OF ENCODER OUTPUT?
S3
YES
S4
COMPARISON BETWEEN ENCODER PATTERN AND ROM PATTERN
S5
MATCHING OF PATTERNS?
YES
NO
S6
DISPLAYING OF ERROR
B

FIG. 5B

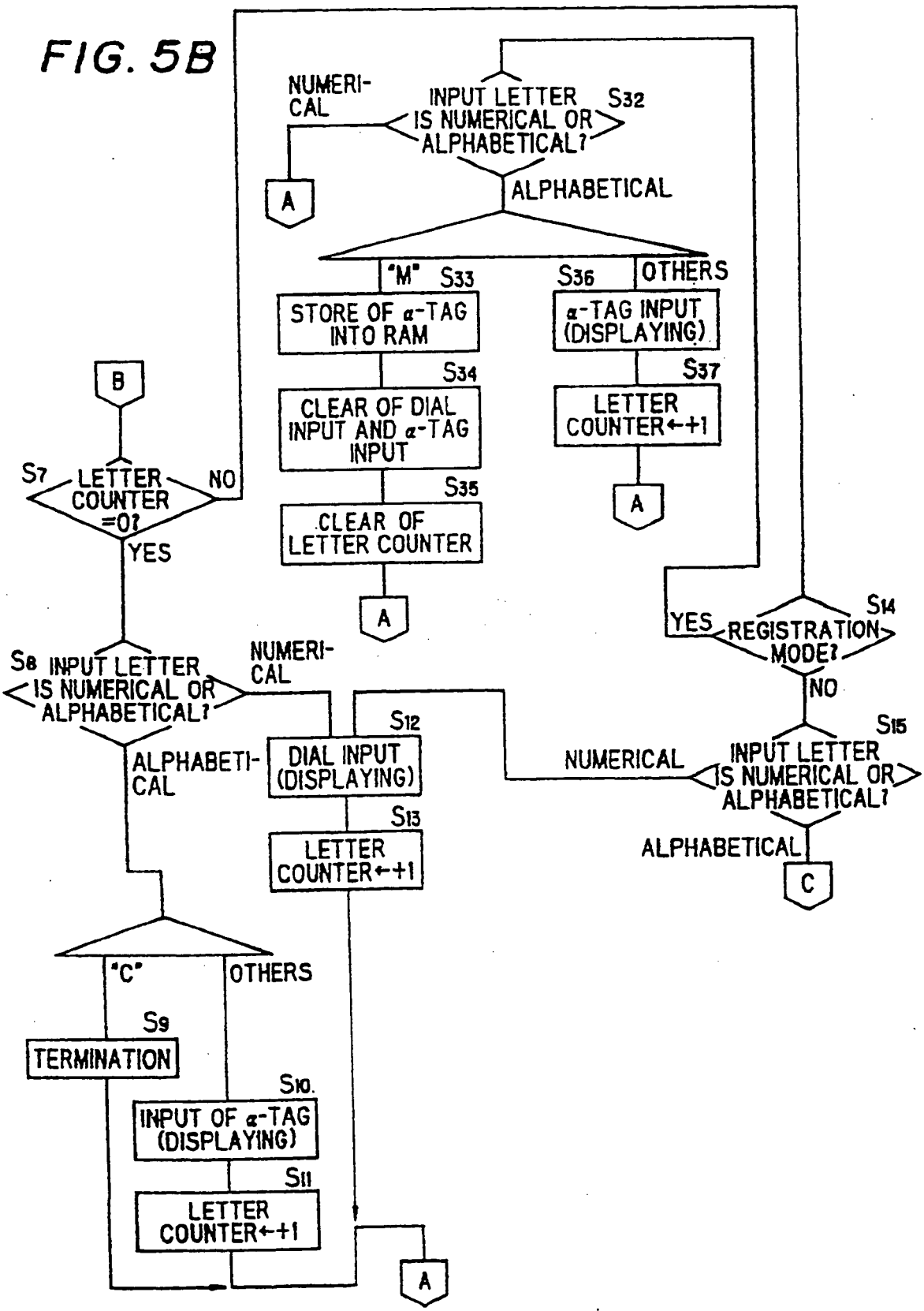
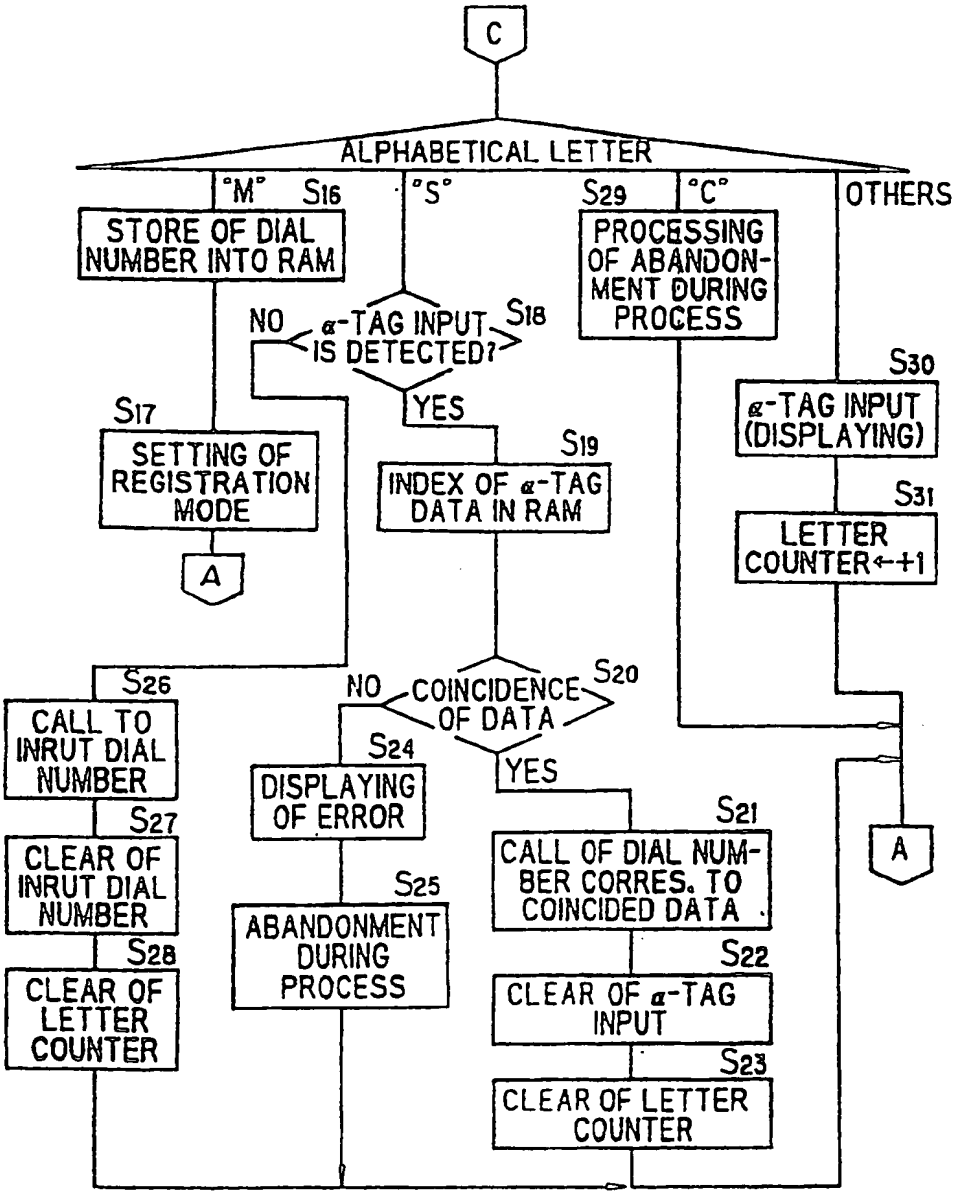

NUMERI-CAL
INPUT LETTER IS NUMERICAL OR ALPHABETICAL?
S32
A
ALPHABETICAL
"M"
S33
OTHERS
S36
STORE OF α-TAG INTO RAM
α-TAG INPUT (DISPLAYING)
S34
S37
CLEAR OF DIAL INPUT AND α-TAG INPUT
LETTER COUNTER←+1
S35
A
CLEAR OF LETTER COUNTER
A
B
S7
LETTER COUNTER =0?
NO
YES
S14
YES
REGISTRATION MODE?
NO
S8
INPUT LETTER IS NUMERICAL OR ALPHABETICAL?
NUMERI-CAL
S12
S15
ALPHABETI-CAL
DIAL INPUT (DISPLAYING)
NUMERICAL
INPUT LETTER IS NUMERICAL OR ALPHABETICAL?
S13
ALPHABETICAL
LETTER COUNTER←+1
C
"C"
OTHERS
S9
TERMINATION
S10.
INPUT OF α-TAG (DISPLAYING)
S11
LETTER COUNTER←+1
A

FIG. 5C


C
ALPHABETICAL LETTER
"M"
S16
"S"
S29
"C"
OTHERS
STORE OF DIAL NUMBER INTO RAM
NO
α-TAG INPUT IS DETECTED?
S18
YES
PROCESSING OF ABANDONMENT DURING PROCESS
S30
α-TAG INPUT (DISPLAYING)
S31
LETTER COUNTER←+1
S17
SETTING OF REGISTRATION MODE
A
S19
INDEX OF α-TAG DATA IN RAM
S26
CALL TO INRUT DIAL NUMBER
S27
CLEAR OF INRUT DIAL NUMBER
S28
CLEAR OF LETTER COUNTER
NO
COINCIDENCE OF DATA
S20
S24
DISPLAYING OF ERROR
S25
ABANDONMENT DURING PROCESS
YES
S21
CALL OF DIAL NUMBER CORRES. TO COINCIDED DATA
S22
CLEAR OF α-TAG INPUT
S23
CLEAR OF LETTER COUNTER
A

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